

THE 2000 CANADIAN PEREGRINE FALCON SURVEY

EDITORS

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ABSTRACT.—National surveys for Peregrine Falcons (*Falco peregrinus*) have been conducted in Canada every five years since 1970. This paper discusses the results of the seventh such survey. In 2000, 22 areas in nine provinces and three territories were searched for three peregrine subspecies. Within the continental *F. p. anatum* range, 374 sites were occupied by territorial peregrines. As in previous surveys, the majority of *anatum* sites were located in the western boreal ecoregion. However, numbers are increasing in populations south of 58°N. The number of *F. p. tundrius* in 2000 was similar to previous surveys at Rankin Inlet, Nunavut and Tuktut Nogait National Park, Northwest Territories. Nine sites occupied on the North Slope of the Yukon Territory is a slight increase in this *tundrius* subgroup. Coastal *F. p. pealei*, on the Queen Charlotte Islands appear to have been stable for at least the past two decades. *Pealei* numbers on the north shore of Vancouver Island and the surrounding area were substantially higher in 2000—largely the result of a more extensive search effort. Reproductive output in 2000 was 1.0 or more young/territorial pair, except in the *anatum* subpopulations of northern Alberta and the Peel River, Yukon Territory where it was 0.7 and 0.6 young/territorial pair, respectively. Overall, with stable populations in the north and growing populations in the south, the peregrine recovery is well underway and in some areas, approaching historical size and probably ecological carrying capacity.

KEY WORDS: *Peregrine Falcon*; *Falco peregrinus*; *status*; *survey*; *Canada*; *reproductive output*.

PROSPECCION DEL HALCÓN PEREGRINO CANADIENSE EN EL 2000

RESUMEN.—Prospecciones nacionales del Halcón Peregrino (*Falco peregrinus*) han sido llevadas a cabo en Canadá cada 5 años desde 1970. Este artículo discute los resultados de la séptima inspección. En el 2000, 22 áreas en nueve provincias y tres territorios fueron monitoreados para tres subspecies de peregrino. Dentro del rango continental de *F. p. anatum*, 374 sitios fueron ocupados por peregrinos territoriales. Al igual que en prospecciones previas, la mayoría de los sitios de *anatum* estuvieron localizados en la ecoregión boreal del oeste. Sin embargo, los números se están incrementando en las poblaciones al sur de 58°N. El número de *F. p. tundrius* en el 2000 fue similar al de surveys previos en Rankin Inlet, en los parques nacionales de Nunavut and Tuktut Nogait de los territorios del Noroeste. Nueve sitios ocupados en la Pendiente norte del territorio de Yukón, es un incremento leve en este subgrupo *tundrius*. El costero *F. p. pealei*, en las Islas Queen Charlotte parece que han estado estables por al menos, las pasadas dos décadas. Los números de *pealei* en la costa norte de la Isla de Vancouver y en las áreas aledañas, fueron sustancialmente más altas en el 2000—debido, en gran medida a un esfuerzo de búsqueda más extensivo. El rendimiento reproductivo en el 2000 fue de 1.0 o más par joven/territorio, excepto en la subpoblación de *anatum* en el norte de Alberta y en el Río Peel (Peel River), Territorio de Yukón donde fue de 0.7 y 0.6 par joven/territorio respectivamente. Globalmente, con poblaciones estables en el norte y poblaciones crecientes en el sur, la recuperación del peregrino es buena y en algunas áreas, se aproxima al tamaño histórico y probablemente a la capacidad de carga ecológica.

[Traducción de César Márquez]

Peregrine Falcons (*Falco peregrinus*) bred historically throughout most regions of Canada and are again breeding in many of these same regions to-

day. Three subspecies of peregrine occur in Canada (White 1968). Generally, the continental *anatum* subspecies breeds south of the treeline from the Atlantic to the Pacific oceans. The smaller, northern *tundrius* subspecies nests along arctic riv-

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ers, lakes, and coastline and inland escarpments. The larger, darker western *pealei* subspecies occupies coastal islands and areas of adjacent mainland British Columbia. The biology of Peregrine Falcons is described by Hickey (1969), Cade et al. (1988), Erickson et al. (1988), and Brown and Amadon (1989).

A decline in peregrine numbers in North America started in the late 1940s and continued up to the mid 1970s (Hickey 1969, Kiff 1988). This decline was linked directly to the contamination of peregrines by pesticides such as DDT, dieldrin, and heptachlor epoxide (Ratcliffe 1969, Risebrough and Peakall 1988). These chemicals occurred in eggs, carcasses and some prey species, causing death, eggshell thinning and breakage, and overall population decline. In response, in 1978 the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) classified *anatum* peregrines as endangered, *tundrius* as threatened, and *pealei* as rare (Martin 1979). Captive-breeding of Peregrine Falcons began in Canada in 1972, releases started in 1975 (Fyfe 1988), and the first captive-raised falcons bred in the wild in 1977 (White et al. 1990). In 1986, a Recovery Team was formed and in 1987 a Recovery Plan was approved (Erickson et al. 1988).

In Canada, researchers began surveying peregrines prior to 1960 (Beebe 1960, Enderson 1965, Fyfe 1969). From 1970 on, national surveys were carried out every 5 yr to determine nest site occupancy and reproductive rates. The 1965 Madison Peregrine Conference and the 1970 and 1975 North American surveys documented the continued downfall of the peregrine (Hickey 1969, Cade and Fyfe 1970, Fyfe et al. 1976). By 1980, numbers were low, but stabilizing in northern Quebec, the Northwest Territories, (including today's Nunavut Territory) and the Yukon. Only one site was occupied in the prairies and the boreal forest south of 58°N and east of the Rocky Mountains (White et al. 1990). Surveys on the Labrador coast in the mid-1980s identified a significant breeding population (Lemon and Brazil 1990). This population expanded to 31 known pairs by 1995. The release of 178 captive-raised young in the Maritimes between 1982 and 1991 (Sam et al. 1994) resulted in the return of this population to six pairs by 1995 (Amirault et al. in press).

By 1985–86, west coast and northern populations also had increased or were stable while in the south a small urban population was established by

the reintroduction of captive-raised young (Murphy 1990). Starting in the late 1980s, the releases of captive-raised young were made in fewer areas, with more young per release. The 1990 survey again documented stable or increasing northern and coastal populations with smaller gains made in the south (Holroyd and Banasch 1996). In 1992, COSEWIC reclassified *tundrius* as vulnerable (Bromley 1992). By 1995, stable or increasing survey numbers of *anatum* met the objectives set previously for six management zones across Canada (Erickson et al. 1988, Banasch and Holroyd in press). In 1999, *pealei* were retained as a species of special concern (COSEWIC 2000) and *anatum* were downlisted from endangered to threatened (Johnstone 1999).

The purpose of this paper is to present results of the 2000 national survey that documented the population status and reproductive output of Canada's Peregrine Falcons. By comparing these data with data from previous surveys, we can evaluate the success of past management actions, reevaluate status designations, continue to monitor the complete and successful recovery of this species, and determine what management actions are required in the future.

GENERAL METHODS

In 2000, the survey included a comparable number of sites with effort similar to previous 5-yr surveys such that population numbers and reproductive data could be compared with the past six national surveys. Although the focus of surveys was to visit historical nest sites, new sites found during and in-between 5-yr surveys were also included. Previous survey results were taken from Cade and Fyfe (1970), Fyfe et al. (1976), Court et al. (1988a), Munro and Van Drimmelen (1988), Murphy (1990), White et al. (1990), Holroyd and Banasch (1996), and Banasch and Holroyd (in press). As with all surveys, however, there are some limitations. Timing of surveys varied from mid-May to the end of July. While every effort is made to conduct 5-yr surveys during the same stage of the breeding cycle, logistics, weather, funding, and time constraints dictate changes from survey to survey. Any effects from a change of mode and timing on results are identified in the regional accounts that follow.

Definitions used in the 2000 survey are consistent with those generally accepted and used in previous surveys (Murphy 1990, Holroyd and Banasch 1996). "Nest site" is the actual site of the nest on a cliff, however, the exact location of the nest may vary from year to year; "occupied site" or "occupied territory" is a location where one or two territorial adults were present; "territorial pair" is a pair that defended its nesting cliff against other peregrines or human intruders, or a pair that is persistent in remaining at the site; "breeding pair" is a pair that laid at least one egg; and "successful pair" is a pair that raised

at least one chick to fledging or that was assumed to have fledged. "Known sites" include all historically-occupied sites and any sites found occupied prior to the survey year. Sites found during the 2000 survey were "new sites." If single falcons were seen only once and no territorial behaviour was observed, or birds did not remain at a site, they were considered "sightings."

Subspecies distinctions were assigned to regional populations on the basis of historical range and were reinforced by surveyor observations of physical appearance (for an overview of peregrine subspecies distinctions see White and Boyce 1988). These distinctions are consistent with previous surveys.

Only young produced in the wild (i.e., not captive-raised) were included in determining the reproductive output of pairs. Reproductive measurements include the mean number of young fledged or assumed to have fledged/successful pair and the number of young/territorial pair (a pair that actively defends or is persistent at a nest site).

REGIONAL ACCOUNTS

Labrador, Newfoundland. *Contributed by Joe Brazil, Inland Fish and Wildlife Division, Department of Forest Resources and Agrifoods, Box 8700, St. John's, NF A1B 4J6 Canada.*

Survey area and methods. Along the Labrador coast of Newfoundland, two helicopter crews surveyed 63 historical sites. The first survey was conducted 8–12 July and covered the southern coastal nests as well as most of the interior sites. The second survey was conducted 26–31 July covering the northern coastal nests from Hopedale north as well as the rest of the interior sites.

Results and discussion. Of 63 known sites surveyed, peregrines occupied 22; single birds occupied seven; and territorial pairs occupied 15 sites. At the 15 sites, ten had young present, two had nests with eggs and two had females believed to be incubating. Ten pairs successfully produced 24 young for ratios of 2.4 young/successful pair and 1.6 young/territorial pair.

Survey area and effort was similar to that in 1995 except that more inland sites (63 versus 42) were visited in 2000. The number of occupied sites declined from 31 in 1995 to only 22 in 2000. The 1995 figure (31) was the highest number of occupied sites ever recorded in Labrador, although this was partly the result of increased search effort in the intervening period between 1990 and 1995 surveys (Brazil et al. in press). The 2000 figure (22) was similar to the number of occupied sites in 1990 (21). Declines in 2000 occurred largely in the inland sites, which were surveyed a month later than in 1995. One particular valley that had 11 of 13

sites occupied in 1999 had only two sites occupied in 2000. A single territorial bird held one of these. A cold, wet, snowy spring together with the presence of fresh white wash (excrement) at 11 sites unoccupied at the time of the survey, suggests weather and early nest failures may have been a factor in this decline. More surveys will be conducted in the near future.

Bay of Fundy (New Brunswick and Nova Scotia). *Contributed by Diane L. Amirault, Canadian Wildlife Service, Atlantic Region, P.O. Box 6227, Sackville, New Brunswick E4L 1G6 Canada, and Mark F. Elderkin, Wildlife Division, Nova Scotia Department of Natural Resources, 136 Exhibition Street, Kentville, NS B4N 4E5 Canada.*

Survey area and methods. In Nova Scotia, surveys included intensive aerial and ground checks of all known nest sites, suitable coastal habitat, and known nesting pairs. On 12–13 June, observers used a Hughes 500 helicopter to survey the Inner Bay of Fundy from Digby through Lower Blomidon and both sides of Cape Chignecto peninsula from Great Village to Joggins; the west coast of Cape Breton Island; and a series of coastal islands in St. Margaret's Bay on the Atlantic shore including Shut-In-Island, where a pair was believed to have nested successfully in 1999. Known nesting pairs were visited at least twice—early June and mid-July, to establish reproductive success.

In New Brunswick, a 1-d helicopter survey of known and potential sites was conducted on 7 July, along the Bay of Fundy coast from Saint John, northeast to the Mary's Point area, along the Petitcodiac River, and Dorchester Cape and Wood Point within Shepody Bay. Several inland sites with potential habitat were also checked with the exception of Swan Lake, which lacks suitable nesting habitat. The canyons surrounding Little Salmon River, although not previously surveyed, were covered because habitat looked suitable.

In addition to aerial surveys, young were banded in two occupied nests. A ground search late in the season was conducted in the Bayfield area, New Brunswick, because of repeated reports of Peregrine Falcon sightings throughout the season, despite the lack of suitable nesting sites. Reports from Fundy National Park wardens (Parks Canada) and local naturalists supplemented survey efforts.

Results and discussion. In Nova Scotia, five breeding pairs were located, all on cliffs within the Inner Bay of Fundy. Four pairs fledged 12 young. The

fifth pair, new in 2000, hatched at least one young that did not survive.

In New Brunswick, two known nest sites located within Shepody Bay and one known nest on Grand Manan Island were occupied. Two new territorial pairs were located during aerial surveys—both south of Fundy National Park. A minimum of seven young fledged from these five sites. A sixth pair nested in the Bayfield/Cape Jourmain area, the exact site was not found. A pair of adults was there earlier in the year and one juvenile bird was present on 8 July. One traditional nest site located in Saint John was not occupied, although two adults were present earlier. In addition to the six confirmed pairs, another site at Shepody Bay was not surveyed due to the risk of disturbing a Great Blue Heron (*Ardea herodias*) colony nearby.

The number of sites occupied in the Bay of Fundy (on both the Nova Scotia and New Brunswick sides) increased from six in 1995 to 11 in 2000 and is probably nearing historical numbers. Stocck and Pearce (1978) documented 13 historical sites in Nova Scotia and New Brunswick combined. Reproductive output in 2000 averaged 1.8 young/territorial pair and 2.0 young/successful pair.

Southern Quebec. *Contributed by Michel Lepage Société de la Faune et Des Parcs du Québec, Direction du Développement de la Faune, 675, Boul. René-Lévesque Est. 11^e étage PQ G1R 5V7 Canada.*

Survey area and methods. In 2000, surveys were limited to portions of Québec located south of 49°N. In all, 63 sites were visited including the group of rock cliffs along the Saguenay River, where three sites were occupied in 1995. No surveys were conducted in the Gaspé Peninsula because no previous information was available from there. The survey crew visited all 23 known sites where nesting previously occurred. In addition, the regional staff of the Société de la Faune et Des Parcs surveyed 28 other high-potential sites. Between two and four visits were made to each occupied site including prior to fledging of young, which enabled the survey crew to evaluate reproductive success. Surveys were conducted from ground or from boat.

Results and discussion. In 2000, Peregrine Falcons occupied 16 historical and 12 new sites; 25 sites were occupied by a pair and three by a single adult. There were 39 fledged young for 17 pairs. Reproductive output was 1.6 young/territorial pair and 2.3 young/successful pair. The majority of the 12 new sites were discovered by bird watchers and or-

nithologists as part of the Inventory Program for Threatened Bird Species in Québec.

Although the number of sites visited in 2000 (68) was less than those visited in 1995 (112), the number of occupied territories rose from 15 in 1995 to 28 in 2000 (87% increase). Pairs increased from 13–25 (92% increase). However, 12 new sites were located through the Inventory Program for Threatened Bird Species in Québec and may reflect both different search effort and population growth. The survey confirms that most natural cliffs where Peregrine Falcons are found continue to be occupied annually. With at least six pairs, the Saguenay River area is particularly exceptional.

Most of the 28 occupied sites are on rock cliffs located along water. Only eight are on artificial structures such as skyscrapers, bridges or quarries. In at least three cases, one bird wore a red band, indicating it was released during the Canadian Peregrine Falcon release program. With no Peregrine Falcon releases in Québec since 1994 and the majority of birds in the 1995 survey without a band, we believe that some of the birds released in Ontario over the last few years have settled in Québec.

Southern Ontario. *Contributed by Brian Ratcliff and Ted Armstrong, Ontario Ministry of Natural Resources, 435 South James Street, Suite 221, Thunder Bay, ON P7E 6S8 Canada.*

Survey area and methods. Between 28 February and 11 August, surveyors and site monitors visited 40 known sites, 18 new sites, and hundreds of cliff sites in suitable habitat on foot, by boat, and helicopter (Ratcliff and Armstrong 2000). The total area surveyed extended from Thunder Bay east along Lake Superior to Sault Ste. Marie, east to North Bay, and south to Bruce Peninsula on Lake Huron. Urban centres were searched and local monitoring programs were established for known sites.

Results and discussion. There were 53 occupied sites, including 42 with territorial pairs. Attempted nesting was recorded for 31 pairs; 26 produced 68 young for 2.6 young/successful pair and 1.6 young/territorial pair. Most sites (31 or 58%) in 2000 were on cliffs located in the Lake Superior basin. In southern Ontario, urban sites dominated with nine pairs in Toronto (3), Hamilton, Ottawa, London, Mississauga, Nanticoke, and Niagara Falls. A single cliff nest in southern Ontario was located on the Bruce Peninsula, an area that peregrines reoccupied in 2000 after a 70-yr absence. The remaining 12 sites were located in both urban (6)

and rural locations (6) across the Great Lakes basin for a total of 38 cliff and 15 urban sites.

Ontario's Peregrine Falcon (*F. p. anatum*) population declined dramatically in the 1950s and 1960s with the last known nesting attempt in northern Ontario in 1963 (Armstrong in press). Captive-raised young were released between 1977 and 1996. Recovery was slow, however, with only a lone adult occupying a single territory in 1985 (Armstrong in press). In 1986, one pair and a lone bird occupied two territories (Murphy 1990). Two nesting pairs and a single territorial bird were observed during 1990 (Holroyd and Banasch 1996). Several additional occupied sites were located between 1990 and 1995 (Armstrong in press). Ontario's 2000 survey demonstrated a three-fold increase; from 15 occupied sites and 14 territorial pairs in 1995 (Ratcliff and Armstrong 2000). Although the exact proportions are unknown, this increase is partly due to increased search effort in 2000 and partly to natural population growth. An estimate of natural increase can be obtained for the west end of Lake Superior where the same effort (number of sites examined) was expended each year since 1997. There, occupancy has increased from 11 in 1997 to 23 in 2000, a natural growth rate of 109% over three years (28% annually). Similarly, the number of urban sites in southern Ontario increased from three in 1995 to 13 in 2000 (growth of 333% or 34% annually).

A total of 117 young were banded at nests adjacent to Lake Superior since 1996 and at least a portion of the current population expansion is from natural reproduction as young birds return as adults to nest. The occurrence of USA-banded birds in Ontario between 1996 and 2000, in particular five in 2000, indicates the Ontario population is at least mixing with or is a part of a larger, adjacent population. Of 33 known origin (banded) adults, five (15%) were from the U.S. (Ohio and Pennsylvania), three (9%) were from Canadian reintroduction programs and the remainder (76%) were bred and banded in the wild in Canada.

Southern Manitoba. *Contributed by Tracy Macona-chie, Manitoba Peregrine Falcon Recovery Project, Box 24, 200 Saulteaux Crescent, Winnipeg, MB R3J 3W3 Canada.*

Survey area and methods. Because of the lack of records for northern Manitoba (Bechard 1981) and financial constraints, the 2000 survey effort was reduced from 1995, concentrating on known nesting, hacking, or roosting sites in and around

urban centers that were involved in the release of 170 young between 1981 and 1996 including Winnipeg, Brandon, Portage la Prairie, and Gimli (Jones et al. in press).

Results and discussion. In 2000, 21 sites with potential habitat in southern Manitoba were surveyed. Three nesting sites were occupied and monitored throughout the breeding season. These sites had two pairs (one in Winnipeg and one in Brandon) and a single bird (in Winnipeg). The two pairs hatched five young of which four successfully fledged, all from the nest in Brandon. Therefore, 4.0 young fledged/successful pair and 2.0 young fledged/territorial pair.

The 2000 data represent a decline in Manitoba peregrines from four pairs in 1995 (three sites in Winnipeg and a fourth in Brandon) (Jones et al. in press) to two in 2000. However, Manitoba peregrines are part of a larger mid-continental population (Jones et al. in press). Birds released here have been re-sighted in Saskatchewan, Alberta, and Nebraska. The first female to nest in Manitoba in 1989 was from Minnesota and a female from Iowa replaced her. Despite management, this population remains small; never exceeding four pairs, and this is unlikely to change. However, some turnover is expected in the near future as the two breeding females are 9 and 11 yr old.

Southern Saskatchewan. *Contributed by W.J. Patrick Thompson, Box 234, Clavet, SK S0K 0Y0 Canada.*

Survey area and methods. Because historical evidence for the presence of Peregrine Falcons (*F. p. anatum*) is scarce in Saskatchewan (Thompson in press) and previous surveys in potential habitat in the north discovered no nest sites, no formal survey was undertaken in Saskatchewan during 2000. However, all previously occupied urban sites were visited and, if occupied, monitored to record nesting success.

Results and discussion. In 2000, four occupied sites were located in urban areas. In Regina, a 12-yr-old female released in Winnipeg during 1988 paired with a wild 1990 male from Saskatoon. The pair fledged four young, but one young male subsequently died from a collision and a young female was turned into the Veterinary College with probable secondary carbamate poisoning. In Saskatoon, a pair produced four eggs, but abandoned them after the male disappeared midway through incubation. New, since the 1995 survey, are pairs at Moose Jaw and Prince Albert. The Moose Jaw nest site was not located (it moved from the previous

year's site), but an adult female and fledging female seen in the city in mid-July indicate a pair nested locally. In Prince Albert, a single territorial male was seen several times during the spring and summer.

In 2000, three pairs attempted breeding and two pairs fledged young. One pair successfully fledged four young. Though not located, the Moose Jaw site was believed to have fledged at least one young. To date, no occupied rural sites have been confirmed in Saskatchewan. Though anecdotal, no peregrines were seen in the South Saskatchewan River and area in 2000 (B. Hanbridge and R. Rafuse pers. comm., and P. Thompson unpubl. data). The Saskatchewan population is part of a larger mid-continental population, but, this population is unlikely to grow in the near future.

Alberta, South of 58°N. *Contributed by Rob Corrigan, Alberta Conservation Association (in partnership with Natural Resources Service, Alberta Environment), #111, 4999-98 Avenue, Edmonton, AB T6B 2X3 Canada.*

Survey area and method. Court (1993) documented peregrines as "a relatively common summer resident" in central and southern Alberta before their decline in the mid-20th century. In 2000, surveys were conducted from helicopter, boat, and on foot. Coverage was similar to the 1995 survey with 76 of 78 historical and previously known sites (Court 1993, Corrigan 2000) visited as well as suitable sites along several of Alberta's major river systems.

Results and discussion. In 2000, 23 territories were occupied by pairs. Two sites were new including the first rural site on the North Saskatchewan River since the 1960s. Nest sites were located predominantly in urban areas or on man-made structures (14). There were nine rural cliff sites, which were located mostly on the Red Deer River (7). All together, 19 successful pairs produced 57 young.

Survey results (23 territories) showed an obvious significant increase in the population from 1995 (13 territories). This increase is due in part to the 223 captive-raised young released in central and southern Alberta between 1992 and 1996 (Stepnisky 1996). As well, the 80% (5-9) increase in pairs returning to rural sites indicated a recovery is underway. An average of 3.0 young/successful pair and 2.5 young/territorial pair marked an extremely good reproductive year. Of interest was: a Washington coast yearling female recovered near Drumheller, the first known occurrence of a northern Alberta banded falcon breeding in the south-

ern population (near Edmonton), and the recovery of a central Alberta bred peregrine within 100 km of the arctic coast in the Northwest Territories. As Corrigan (2000) points out, such recoveries indicate the Alberta population is not closed, and is in fact, mixing with the larger continental population.

Alberta, North of 58°, Wood Buffalo National Park and Adjacent Northwest Territories. *Contributed by Rob Corrigan, Alberta Conservation Association (in partnership with Natural Resources Service, Alberta Environment), #111, 4999-98 Avenue, Edmonton, AB T6B 2X3 Canada, Mark Bradley, Wood Buffalo National Park, Parks Canada, Fort Smith, NT, X0E 0P0 Canada, and Geoffrey Holroyd, Canadian Wildlife Service, Room 200, 4999-98 Ave. Edmonton, AB T6B 2X3 Canada.*

Survey area and methods. Peregrine Falcons (*F. p. anatum*) were first observed in Wood Buffalo National Park in 1966 (Moore et al. in press). The population low reached three pairs in 1975 and remained below ten occupied sites until 1992. From 1993-95, pairs increased from 12-23 in part due to increased search effort, which located four new sites. The area surveyed in 2000 included 27 known sites in northeastern Alberta and 21 sites within Wood Buffalo National Park (including both the Alberta and Northwest Territories portions of the park). In addition, approximately 100 cliffs were surveyed on the granite Canadian Shield east of the Slave River in northeast Alberta and the adjacent Northwest Territories. In 1995, 142 cliffs were surveyed in the same area. Most breeding sites were visited by helicopter, but sites near Fort Chipewyan were visited by boat and a few near Fort Smith were checked on foot. These survey methods were similar to 1995.

Results and discussion. In 2000, territorial pairs occupied 29 sites; only 23 attempted breeding. Of those, eight were successful, producing 21 young for a mean of 2.6 young/successful pair and 0.7 young/territorial pair.

The number of occupied territories in 2000 (29) was higher than 1995 (23). This increase was not due to additional survey effort, but represents additional pairs occupying sites and suitable cliffs that were surveyed both in 1995 and 2000.

Reproduction was extremely poor. While the majority of territorial pairs laid eggs, a number of pairs around the Fort Chipewyan area failed to fledge young. Weather may have been a factor, although sustained, cold, wet weather was not re-

corded in June at the Fort Chipewyan weather station. Reproduction per territorial pair was higher, over 1.5 young, from 1987–99 (G. Holroyd and M. Bradley unpubl. data), so we suggest that 2000 was an anomalous year.

Southwestern and Interior British Columbia (BC). *Contributed by Michael J. Chutter, British Columbia Wildlife Branch, Ministry of Environment, P.O. Box 9374, Stn. Prov. Govt., Victoria, BC V8W 9M4 Canada.*

Survey area and methods. Peregrine Falcons (*F. p. anatum*) in BC occupy the interior, lower mainland (Fraser Valley), southeast Vancouver Island, and the Gulf Islands. A helicopter survey of the lower mainland on 15 June visited eight previously known sites in the Fraser River area. Activity at two other sites was confirmed from the ground prior to the helicopter survey. All of the Vancouver Island areas, including new areas along the west and east coasts and the Gulf Islands, received more complete and expanded coverage than in previous surveys. The Gulf Islands were surveyed by boat on 15 May and 17 May and by helicopter 29–30 May. Vancouver Island was surveyed by boat 5–8 June and by helicopter on 15–16 June.

Results and discussion. During 1996, surveys in the South Okanogan located a territorial pair—the first in the area since 1959 (Chutter in press). From 1998–2000, 30 captive-raised young were released in and near Kelowna (M. Krupa pers. comm.). In 2000, incidental reports confirmed a territorial pair in the Thompson/Nicola area of the southern interior. Two other possible pairs were unconfirmed, one in the Thompson/Nicola area and one in the Williams Lake area. On the lower mainland, six sites were occupied; one site by a single territorial adult and five by territorial pairs. In the southeast Vancouver Island and Gulf Islands, 11 known sites were surveyed along the southeast coast and in the Gulf Islands, plus two new sites and several potentially suitable cliffs. Nine known and two new sites were occupied—nine with territorial pairs and two with single territorial adults. Reproductive output was not determined.

In 1995, Paul DeBruyn visited 38 known *anatum* sites in BC (Chutter in press). Of these, 21 were on cliffs near lakes, rivers, and coastal areas of the lower mainland and southwest Fraser River area including the Gulf Islands. Eleven sites were in the southern interior, four in the central interior and one each in the northwest and northeast interior areas. DeBruyn reported 19 sites occupied (17 in

the southwest, a new site in the Thompson area of the southern interior and one historical site in the northern part of the central interior). Thus, in the southern interior, lower mainland and southeast Vancouver Island and Gulf Islands, the 18 occupied sites in 2000 was comparable to 1995 results of 19 occupied sites, although areas surveyed may have differed slightly between years.

Queen Charlotte, Langara, North Vancouver, and Scott Islands, British Columbia. *Contributed by Michael J. Chutter, British Columbia Wildlife Branch, Ministry of Environment, P.O. Box 9374, Stn. Prov. Govt., Victoria, BC V8W 9M4 Canada.*

Survey area and methods. Coastal Peregrine Falcons (*F. p. pealei*) have been surveyed by the British Columbia (BC) Wildlife Branch on the Queen Charlotte Islands since the early 1960s and in the north Vancouver Island area starting in 1980 (Chutter in press). Wayne Nelson surveyed peregrines of Langara Island annually since 1968 (Nelson in press). In 1995, 87 sites were occupied in this area including 62 sites in the Queen Charlotte Islands, 7 on Langara Island, 10 on the north shore of Vancouver Island and 8 on Triangle Island. In 2000, the main survey of the Queen Charlotte Islands was conducted by boat from 18–28 May with additional surveys by boat of Langara, Reef Island, and Limestone Islands later in May and early June. The west side of Kunghit was checked in June.

Results and discussion. All combined, the 2000 survey was probably the most extensive survey of this area to date. In total, 160 of 162 known sites, six new sites, and many other suitable sites were surveyed on the above islands. As well, the north and northwest shore of Vancouver Island, the surrounding Scott Islands, other offshore islands, and parts of the adjacent mainland were surveyed including 31 known, six new, and many potential cliffs.

On the Queen Charlotte Islands, including Langara Island, 69 sites were occupied with 51 pairs defending nests. The remaining 18 sites had persistent single birds in attendance and may well have been pairs, hence the number of pairs reported here is probably an underestimate. As occupancy was the focus of the survey, reproductive data were not collected except on Langara Island, where Wayne Nelson surveyed between 31 May and 7 June. Nelson recorded nine occupied territories with two single adults and seven pairs of which five successful pairs produced nine young. For north Vancouver Island and Triangle Island, 27 of 37 sites

surveyed were occupied: 18 sites had pairs defending or an adult with a young, nine had single birds present.

The total number of territories occupied by *pealei* in BC in 2000 (96) increased over the number in 1995 (87). This increase occurred on the north part of Vancouver Island and other surrounding islands, which was surveyed more intensively in 2000 than in previous surveys. Thus, we believe the increase to be largely due to more complete survey effort. Overall, the BC *pealei* population is considered to be stable to slightly increasing.

Yukon Interior. *Contributed by Dave Mossop, Yukon College, Box 2799, Whitehorse, YT Y1A 4K4 Canada.*

Survey area and methods. Peregrine Falcons (*F. p. anatum*) breed on the cliffs of rivers draining the central Yukon. The 2000 survey was designed to monitor reproduction in the previously best-monitored core areas of each sub-population. Two sub-drainages of the Peel River were not surveyed in 2000 resulting in a smaller sample of 31 different sites in 2000 compared to 40 in 1995. The scheduling of a single survey was planned to coincide with observing young approximately 20 d old. Volunteers were divided into six teams that accessed sites by boat between 27 June and 20 July. The Southern Lakes area was not surveyed in 2000 except for a visit to one unoccupied site.

Results and discussion. Of 132 sites visited in the central Yukon during 2000 on the Porcupine, Yukon, and Peel River drainages, 88 known and 15 new sites were occupied for a total of 103 territories. Of these, 55 pairs showed successful reproduction.

Although a total of 113 territories was recorded in the previous survey, based on the comparison of the same survey areas, a growth in occupancy of approximately 2.5% annually occurred since 1995 (Mossop 2000). Peregrines on the Porcupine River declined in the late 1960s, but retained a remnant population (Mossop in press). This population was the first to recover and increased up to 1990. It has remained stable over the last decade. Peregrines on the Peel River declined in the 1960s, but also retained a remnant population. They increased slowly in 1990 with significant growth in 1995 (Mossop in press). The Yukon River population declined throughout the early 1970s and with only one known occupied territory remaining, captive-raised young were fostered there from 1978–92. By 1990, this population was well above known historical levels. Over the past five years, this population

appears to have stabilized with 46 pairs identified in both the 1995 and 2000 surveys. The small number of known peregrines in the southern lakes population disappeared during the 1970s. In 1990, this population was thought to be extirpated; however, one successfully-occupied territory was located in 1995.

The production of young was very low in 2000, but at least 53% of territorial pairs produced fledglings. Clearly, monitoring on a 5-yr cycle poses some risk of hitting below average years of reproduction making the results difficult to interpret.

Yukon North Slope. *Contributed by Dave Mossop, Yukon College, Box 2799, Whitehorse, YT Y1A 4K4 Canada.*

Survey area and methods. The 2000 Yukon survey was designed to monitor reproduction in sample areas of sub-populations of which the North Slope drainage is the only Yukon area surveyed for *F. p. tundrius*. Surveys were conducted by helicopter on 11–14 July.

Results and discussion. The survey of 16 known and four new territories resulted in the location of nine occupied sites. Seven territorial pairs raised 15 young for a mean of 2.1 young/successful pair.

Peregrines (*F. p. tundrius*) on the North Slope of the Yukon were thought to be extirpated locally in 1980 (Mossop in press). Reintroductions of captive-raised young were conducted from 1983–85. In the 1990 survey, a single adult occupied a territory that had previously been occupied by a pair with three eggs in 1989 (Holroyd and Banasch 1996). Annual surveys since 1990 showed this population was in the initial stages of recovery. By 1995, there were five known nesting pairs, three produced young (Mossop in press). The number of occupied territories (9) on the Yukon's North Slope drainage increased since the 1995 survey (5 occupied territories). Within the same area surveyed during both surveys, two new nesting pairs were located and one pair disappeared in 2000 (Mossop 2000). Ivvavik National Park staff also cooperated, for the first time, in this year's effort, locating three new pairs and expanding the area now included in the survey. The North Slope population remains of concern with only seven known pairs found at the 20 territories visited.

Mackenzie Valley, Northwest Territories. *Contributed by Steve Matthews and Suzanne Carrière, Department of Resources, Wildlife and Economic Development, Government of the Northwest Territories, Scotia Centre 5th Floor, Yellowknife, NT X1A 3S8 Canada.*

Survey area and methods. Surveys for Peregrine Falcons (*F. p. anatum*) along the Mackenzie River have occurred over the last three decades (Shank in press). The 2000 survey covered the Mackenzie Valley from Saline River, about 80 km upstream from Tulita (Fort Norman), to Inuvik, Northwest Territories (NT). The area surveyed in 2000 is the same as that surveyed in both 1990 and 1995, with some minor exceptions. Ten nest sites recorded in 1995 were not examined in 2000 due to fog, time constraints, or unknown coordinates.

We surveyed the entire study area by helicopter from 17–21 July. From 12–22 July, Keith Hodson surveyed by boat the portions of the study area directly on the Mackenzie River. All sites surveyed by boat were also surveyed by helicopter, but not vice versa.

Results and discussion. A total of 118 known sites were surveyed. As well, four new sites were found. Of the known sites, 76 (64%) were occupied in 2000. Only 37 pairs of 80 occupied sites were successful with a total of 80 young fledged from 36 sites. Mean reproduction was 1.0 young/territorial pair and 2.2 young/successful pair.

Mackenzie Valley peregrines increased dramatically through the 1980s until about 1990, when they were believed to have reached “ecological carrying capacity.” Numbers have remained fairly constant during the last decade, despite some annual fluctuations in breeding success. In 1995, 83 sites were occupied (Shank in press). In 2000, occupancy (80 sites) was slightly less than in the 1995 (83 sites) and 1990 (88 sites) surveys. However, some apparent decline may be due to the ten known sites not visited in 2000. The surveyed portions of the Mackenzie Valley may have reached a maximum occupancy for Peregrine Falcon territorial pairs in the 1990s. Similar to the 1995 survey (Shank in press), forest fires might have affected nesting occupancy and success. In 2000, we noted that some sites were lost due to fire: old raven stick nests previously used by peregrines were burned or the cliff face was modified by slumping and mud deposition.

In 2000, reproductive output, measured as the mean number of young/reproducing pair, was not significantly different from the mean of 2.3 recorded during surveys between 1969 and 1995 ($t = -0.21$, $df = 22$, $P > 0.5$). Despite habitat changes and some annual variability in reproduction during the last decade, the number of sites occupied by Peregrine Falcons during the last decade in the

Mackenzie Valley has been the highest since the survey was initiated in the mid-1960s.

Rankin Inlet, Nunavut. *Contributed by David Abernethy and Josh Hunter, Nunavut Dept. of Sustainable Development, 3rd Floor, Brown Building, P.O. Box 1340, Iqaluit, NU, X0A 0H0 Canada, and Gordon Court, Natural Resources Service, Alberta Environment, 6909-116 St. Edmonton, AB T6H 4P2 Canada.*

Survey area and methods. Peregrine Falcons (*F. p. tundrius*) have been under intensive study at Rankin Inlet, on the northwest shore of Hudson’s Bay, Nunavut, since 1980 (Court et al. 1988b). Population size and reproductive performance of all pairs within the circumscribed boundaries of the 450-km² study area were reported in national peregrine inventories in 1985, 1990, and 1995. In 2000, a single survey for territorial occupancy and reproductive output at 39 known nesting cliffs was conducted in late July.

Results and discussion. In the 2000 survey, 22 pairs of adults and three lone birds were detected at 25 sites. Sixteen successful pairs had a total of 37 young yielding 1.7 young/territorial pair and 2.3 young/successful pair.

Up to 29 pairs (annual mean 24) have occupied territories in the study area in any given year since survey boundaries and protocols were standardized in 1982. Bradley et al. (1997) summarized breeding success for the peregrine population over 13 years (1982–94) and found that in most years, 13 territorial pairs fledged young and, on average, 1.4 young (0.6–2.5 per year) were fledged/territorial pair; 2.5 were fledged/successful pair (1.8–3.1 per year). Weather conditions and prey abundance are known to have dramatic effects on the reproduction of this population (Court et al. 1988a, Bradley et al. 1997). Comparing these data to historical measures of occupancy and reproductive performance, we suggest that 2000 was an average to above-average year for the Peregrine Falcons at Rankin Inlet.

Tuktut Nogait National Park, NT. *Contributed by Joachim Obst, Box 1888, Yellowknife, NT X1A 2P4 Canada.*

Survey area and methods. In 1988 and 1990, extensive ground surveys for raptors were conducted throughout Tuktut Nogait National Park, northeast Northwest Territories. In 1991, 1996, and 1999, supplemental data were collected from visits to additional nesting sites. In total, 53 peregrine (*F. p. tundrius*) territories were identified in the park including 31 sites on the Hornaday River. In 2000,

from 17–26 July, three Parks Canada teams surveyed 160 km of the Hornaday River in the western part of Tuktut Nogait National Park by boat and on foot. Surveyors revisited 18 known sites visited previously in 1988 or 1990, as well as four new territories within the survey area. Sites were observed for 0.5–3.0 hr using a spotting scope.

Results and discussion. The 2000 survey confirmed 13 reproducing pairs, a territorial pair, and a territorial adult male in 15 of 18 known territories. Occupancy could not be ascertained at three sites due to inadequate survey time, although at two of these, fresh whitewash and/or prey remains were present indicating presence of young. In addition, four new territories with reproducing pairs were found in 2000 for a total of 19 occupied territories. Seven pairs had 18 young for a mean of 2.6 young/successful pair. Another three pairs were observed with one or more young, however, numbers of young were not confirmed. All of the remaining pairs, except for one territorial pair, were assumed to have young because they displayed vigorous defense behavior at known nest sites.

Results for 2000 indicate a stable population of Peregrine Falcons on the Hornaday River for the past decade. Although only 15 of 18 territories occupied in 1988 or 1990 were used again in 2000, four new territories in 2000 could represent a shift of pairs to alternate territories. Densities were higher in canyons and average spacing of occupied territories was 1.6 km ($N = 10$) in one section (Zoltai et al. 1992). Pairs averaged 3.1 eggs ($N = 7$) in 1988 and 3.2 eggs ($N = 5$) in 1990. During all surveys, it was not feasible to count the exact number of eggs or young in all nests but most pairs were assumed successful based on their behavior. To clarify the uncertain status of assumed “unoccupied” territories in future surveys, more time is needed for ground observations. Tuktut Nogait National Park offers the opportunity to monitor Peregrine Falcons and other raptors at a relatively low cost through ground surveys.

SYNTHESIS AND CONCLUSION

Since 1970, national surveys have been conducted every five years to locate breeding Peregrine Falcons. Survey results present the known breeding population but do not reflect the total peregrine population size. The total population would include peregrines in areas that were not surveyed, failed breeders that abandoned their sites before

surveys, non-breeding subadults and non-breeding adult floaters, which do not have territories.

Regions surveyed for *anatum* peregrines in 2000 (Table 1) were comparable to those surveyed in 1995 but effort within specific areas varied. The 2000 survey effort was less than in 1995 in Manitoba and Saskatchewan because the northern parts of neither province was searched in 2000. However, effort to identify urban pairs in the southern portion of each province was similar to 1995. Similarly, fewer cliffs east of the Slave River in northern Alberta were surveyed in 2000 than in 1995, but this did not affect numbers in the main study area which had similar survey effort in 1995 and 2000. *Anatum* surveys in the Yukon were concentrated on core areas and two drainages of the Peel River surveyed in 1995 were omitted in 2000. Similarly, 10 sites surveyed in the Mackenzie Valley in 1995 were not surveyed in 2000.

Survey effort for *anatum* was greater in 2000 in Labrador where more inland sites were surveyed. However, surveys were conducted one month later than they were in 1995. Greater effort was also expended in 2000 in the Maritimes, Ontario, and Quebec where park staff and volunteer naturalists contributed sightings that were then verified and included in survey results. As previously noted for Ontario, however, effort for annual surveys of the west end of Lake Superior has been the same since 1997. Effort was also greater in 2000 for the southern portion of Vancouver Island, BC. Effort for *anatum* in southern Alberta, interior BC and the Porcupine and Yukon Rivers, YT, was similar in 2000 to effort in 1995.

Area surveyed for *tundrius* (Table 2) was expanded from previous surveys on the Yukon's North Slope, however, a comparison was provided in the detailed regional account that compared the area covered in both 1995 and 2000. Similarly, data from Tuktut Nogait National Park, added to national results for the first time, were pulled from larger raptor surveys, but represent the findings of a comparable area searched in 1988 and 1990, and 2000. Although the area surveyed was the same at Rankin Inlet, effort was reduced with only one survey (July) conducted compared to two (May and July) in 1995 and many in 1985 and 1990. Ungava Bay *tundrius* were not surveyed in both 1995 and 2000.

Survey efforts for *pealei* (Table 2) were similar to previous years except on Vancouver Island, where the 2000 survey was the most comprehensive to

Table 1. Sites occupied by *anatum* Peregrine Falcons in Canada during 2000. ND = no data.

| AREA | KNOWN SITES | KNOWN SITES CHECKED | KNOWN SITES OCCUPIED | NEW SITES | SITES OCCUPIED: | |
|-------------------------------------------------------|----------------|---------------------------|----------------------------|--------------|-----------------|-----------------|
| | | | | | SINGLE BIRDS | PAIRS |
| Labrador, Newfoundland | 63 | 63 | 22 | 0 | 7 | 15 |
| Bay of Fundy (Nova Scotia, New Brunswick) | 15 | 15 | 8 | 3 | 0 | 11 |
| Southern Quebec | 23 | 23 | 16 | 12 | 3 | 25 |
| Southern Ontario | 76 | 76 | 38 | 15 | 11 | 42 |
| Southern Manitoba | 21 | 21 | 3 | 0 | 1 | 2 |
| Southern Saskatchewan | 4 | 4 | 4 | 0 | 1 | 3 |
| Alberta South of 58°N | 78 | 76 | 21 | 2 | 0 | 23 |
| Interior, British Columbia | 17 | 1 | 1 | 0 | 0 | 1 |
| Lower Mainland, British Columbia | 10 | 9 | 5 | 1 | 1 | 5 |
| Gulf Island and SE Vancouver Island, British Columbia | 11 | 11 | 9 | 2 | 2 | 9 |
| Alberta North of 58°N | 48 | 48 | 27 | 2 | 0 | 29 |
| Porcupine River, Yukon | 45 | 36 | 26 | 9 | 0 | 35 |
| Peel River, Yukon | 48 | 28 | 19 | 3 | 0 | 22 |
| Yukon River, Yukon | 57 | 53 | 43 | 3 | 0 | 46 |
| Southern Lakes, Yukon | 1 | ND | ND | ND | ND | ND |
| Mackenzie Valley, Northwest Territories | 128 | 118 | 76 | 4 | 0 | 80 ^a |
| Total <i>anatum</i> | 645 | 582 | 318 | 56 | 26 | 348 |

^a Although only a single adult with no young was observed at 26 of these sites, given the timing of surveys (mid-July), these sites are included in the number of territorial pairs.

date. Data collected in over half the regions surveyed were comparable between the 1995 and 2000 (Table 3).

Surveys attempted to cover all "historical or known sites" as well as potential sites of suitable nesting habitat. In the regions surveyed, most (ca. 90%) known sites were visited. Regions with unvisited known sites included southern Alberta (2), mainland BC (17), the interior Yukon (34), and Mackenzie Valley (10).

Although measures of reproductive success (Tables 4 and 5) and comparisons between 5-yr surveys (Tables 3 and 6) are made below, differences in survey effort, timing, and conditions must be taken into account before drawing conclusions. Where single surveys are conducted, only a minimum number of occupied territories were documented. Nesting pairs that failed prior to surveys and single adults that have less affinity to their territory may have been missed or undercounted.

Subspecies classification is not always definitive. As well, with the expansion of subspecies' ranges, introgression may be occurring. Although considered *anatum* for this paper, the Labrador, Newfoundland population is likely on the boundary of

tundrius and *anatum*. In southwestern BC, the Fraser River and coastal mainland population is within the historical range of *anatum*. Peregrines on the Gulf Islands and along the southeast shore of Vancouver Island are also believed to be *anatum* (W. Nelson and C. White pers. comm.). And finally, known cases of *anatum* adults in southern Ontario breeding with birds of mixed race from the U.S. seaboard have occurred in recent years. To date, such subspecies classification was based on historical breeding range and physical characteristics. The identification of a genetic marker that could be used to distinguish these subspecies would be extremely worthwhile.

With these limitations in mind, it is important to realize that surveys provide a best estimate of the number of breeding peregrines within an area and do not reflect the total population size. Although comparisons of surveys conducted over 30 yr have their limitations, this large body of data provides a comparable picture of peregrine population trends in Canada.

***Anatum* Populations.** A total of 374 sites were occupied by *anatum* in 2000 (with 93% occupied by pairs), the largest number of occupied territories

Table 2. Sites occupied by *tundrius* and *pealei* Peregrine Falcons in Canada during 2000. ND = no data.

| AREA | KNOWN SITES | KNOWN SITES CHECKED | KNOWN SITES OCCUPIED | NEW SITES | SITES OCCUPIED: | |
|--------------------------------------------------------|-------------|---------------------|----------------------|-----------|-----------------|-------|
| | | | | | SINGLE BIRDS | PAIRS |
| <i>Tundrius</i> | | | | | | |
| Ungava Bay, Quebec | 58 | 0 | ND | ND | ND | ND |
| North Slope, Yukon | 19 | 16 | 5 | 4 | 2 | 7 |
| Rankin Inlet, Nunavut | 39 | 39 | 25 | 0 | 3 | 22 |
| Tuktut Nogait National Park, Northwest Territories | 50 | 18 | 15 ^a | 4 | 1 | 18 |
| Total <i>Tundrius</i> | 166 | 73 | 45 | 8 | 6 | 47 |
| <i>Pealei</i> | | | | | | |
| Langara Island, British Columbia | 9 | 9 | 9 | 0 | 2 | 7 |
| Queen Charlotte Islands, British Columbia | 153 | 151 | 54 | 6 | 16 | 44 |
| North Vancouver and Scott Islands, British Columbia | 24 | 24 | 14 | 6 | 8 | 12 |
| Triangle Island, British Columbia | 10 | 7 | 7 | 0 | 1 | 6 |
| Total <i>Pealei</i> | 196 | 191 | 84 | 12 | 27 | 69 |

^a Two additional sites showed evidence of occupancy (fresh whitewash and/or prey remains) but were not confirmed active.

recorded to date during the 5-yr surveys. Between 1995 and 2000, the total number of occupied *anatum* territories observed increased by approximately 15% (324 to 374) (Table 3). Although this value is influenced by variation in search effort and timing, it is less than the 36% increase observed between 1990 and 1995 (Banasch and Holroyd in press). This declining rate of increase may be indicative of a recovering population that is approaching carrying capacity. Numbers for northern areas representing the largest concentration of peregrines (the Mackenzie Valley, Yukon drainages and northern Alberta) were similar to those recorded in 1995 (219–212) indicating that these regions may have stabilized and/or are approaching saturation.

In contrast, the number of occupied territories in southern Canada increased by 54% (105–162). Southern Ontario showed the largest increase, more than tripling its population (15–53) between 1995 and 2000. While some increase was due to increased search effort, at least part of the population growth is attributed to natural increase. A large number of captive-raised young *anatum*s released in Ontario by hacking through to 1996 are likely responsible for at least a portion of the current breeding population. Other *anatum* populations experiencing significant growth in the num-

ber of occupied territories included the Bay of Fundy, southern Quebec, and southern Alberta, all nearly doubled in size since 1995. Labrador peregrines were the only *anatum* population to register a decline (29%) in the number of occupied territories.

The 15% increase in the number of occupied territories (occupied by a single or pair) is greater than the 9% increase in the number of territorial pairs (319 pairs in 1995 to 348 in 2000). While most *anatum* subpopulations showed increases in the number of territorial pairs, the overall total was reduced by fewer breeding pairs in Labrador and Manitoba and in smaller areas surveyed on the Peel River, Yukon. Newton (1979) described a stable population as one in which "breeding numbers remained absolutely constant or changed by less than 15% of the mean over the period concerned." In 2000, all *anatum* subpopulations showed stable or increasing growth rates in breeding pairs over 1995, except for those in Labrador and southern Manitoba, which both declined by approximately 50% (Table 3).

Although there was some regional variation, overall *anatum* reproductive outputs remained similar to those of 1995 (Table 6) and were clearly not statistically different between the most recent surveys. Mean young/successful pair rose slightly from

Table 3 Number of sites occupied by Peregrine Falcons in selected regions of Canada from 1970 to 2000. Numbers in parentheses indicate the number of territorial pairs present. Numbers in italics indicate 2000 surveys (area and effort) were comparable to 1995. ND = no data.

| AREA | 1965-66 | 1970 | 1975 | 1980 | 1985-86 | 1990 | 1995 | 2000 |
|-----------------------------------------|---------|---------|---------|--------------------|----------|----------------------|-----------|----------------------|
| <i>Anatum</i> | | | | | | | | |
| Labrador, Newfoundland | 0 | 2 (2) | 0 | ND | 2 (2) | 21 (21) | 31 (31) | 22 (15) |
| Bay of Fundy, Nova Scotia, | | | | | | | | |
| New Brunswick | ND (2) | 0 | 0 | 0 | 1 (1) | 7 (5) | 6 (6) | 11 (11) |
| Southern Quebec | ND (2) | 0 | ND | 1 (1) | 1 (1) | 15 (12) | 15 (13) | 28 (25) |
| Southern Ontario | 0 | 0 | 0 | 0 | 1 (0) | 3 (2) | 15 (14) | 53 (42) |
| Southern Manitoba | ND | ND | ND | 0 | 1 (1) | 2 (1) | 4 (4) | 3 (2) |
| Southern Saskatchewan | ND | 0 | ND | 0 | 2 (1) | 2 (1) | 2 (2) | 4 (3) |
| Alberta S. of 58°N | 8 (6) | 1 (1) | 0 | 0 | 2 (2) | 3 (3) | 13 (12) | 23 (23) |
| Interior British Columbia | | ND | ND | ND | ND | ND | 2 (2) | 1 (1) |
| Lower Mainland, British Columbia | | ND | ND | ND | ND | ND | 8 (8) | 6 (5) |
| Gulf Island & SE Vancouver Island, | | | | | | | | |
| British Columbia | ND | ND | ND | 5 (4) ^a | 4 (2) | 6 (3) ^b | 9 (7) | 11 (9) |
| Alberta N. of 58°N | ND (4) | 2 (1) | 3 (3) | 9 (9) | 6 (5) | 9 (9) | 23 (23) | 29 (29) |
| Porcupine River, Yukon | ND | ND | 8 (8) | 16 (13) | 14 (11) | 36 (ND) | 29 (29) | 35 (35) |
| Peel River, Yukon | ND | ND | ND | 18 (12) | 12 (10) | 14 (ND) | 37 (37) | 22 (22) ^c |
| Yukon River, Yukon | ND | 6 (5) | 6 (5) | 12 (10) | 22 (18) | 33 (ND) | 46 (46) | 46 (46) |
| Southern Lakes, Yukon | 14 (ND) | | | | | | 1 (1) | ND |
| Mackenzie Valley, Northwest Territories | | 9 (6) | 24 (21) | 20 (15) | 45 (ND) | 88 (77) | 83 (83) | 80 (80) |
| Total <i>anatum</i> | 22 (14) | 20 (15) | 41 (37) | 81 (64) | 113 (54) | 239 (134) | 324 (319) | 374 (348) |
| <i>Tundrius</i> | | | | | | | | |
| Ungava Bay, Quebec | ND | 12 (9) | 11 (9) | 10 (10) | 23 (23) | 34 (34) | ND | ND |
| North Slope, Yukon | ND | ND | 5 (5) | 2 (0) | 0 | 1 (0) | 5 (5) | 9 (7) |
| Rankin Inlet, Nunavut | ND | ND | ND | 8 (8) ^d | 26 (ND) | 26 (26) | 27 (27) | 25 (22) |
| Tuktut Nogait National Park, | | | | | | | | |
| Northwest Territories | | | | | | 19 (19) ^e | | 19 (18) |
| Total <i>tundrius</i> | ND | 12 (9) | 16 (14) | 20 (18) | 49 (23) | 80 (79) | 32 (32) | 53 (47) |
| <i>Pealei</i> | | | | | | | | |
| Langara Island, British Columbia | 9 (6) | 6 (5) | 6 (6) | 6 (6) | 6 (5) | 7 (7) | 7 (5) | 9 (7) |
| Queen Charlotte Island, | | | | | | | | |
| British Columbia | 76 (55) | 56 (46) | 60 (51) | 73 (58) | 50 (ND) | 64 (53) | 62 (45) | 60 (44) |
| N. Vancouver & Scott Islands, | | | | | | | | |
| British Columbia | ND | ND | ND | ND | 6 (5) | 10 (5) | 10 (6) | 20 (12) |
| Triangle Island, British Columbia | | ND | ND | ND | ND | ND | 8 (8) | 7 (6) |
| Total <i>pealei</i> | 85 (61) | 62 (51) | 66 (57) | 79 (64) | 62 (10) | 81 (65) | 87 (64) | 96 (69) |

^a Gulf Island sites only.

^b Data collected in 1991.

^c A smaller section of the Peel was surveyed in 2000 compared to 1995.

^d Only a partial survey was conducted at Rankin Inlet in 1980 compared to the area surveyed in subsequent years.

^e Tuktut Nogait data were based on surveys in 1988 and 1990

Table 4. Productivity of *anatum* Peregrine Falcons in Canada during 2000. ND = no data.

| AREA | TERRITORIAL PAIRS | SUCCESSFUL PAIRS | TOTAL YOUNG | MEAN YOUNG/ TERRITORIAL PAIR (SAMPLE SIZE) | MEAN YOUNG/ SUCCESSFUL PAIR (SAMPLE SIZE) |
|-----------------------------------------------------------|----------------------|---------------------|----------------|--------------------------------------------------------|----------------------------------------------------|
| Labrador, Newfoundland | 15 | 10 | 24 | 1.6 (15) | 2.4 (10) |
| Bay of Fundy (Nova Scotia, New Brunswick) | 11 | 10 | 20 | 1.8 (11) | 2.0 (10) |
| Southern Quebec | 25 | 17 | 39 | 1.6 (25) | 2.3 (17) |
| Southern Ontario | 42 | 26 | 68 | 1.6 (42) | 2.6 (26) |
| Southern Manitoba | 2 | 1 | 4 | 2 (2) | 4.0 (1) |
| Southern Saskatchewan | 3 | 1 | 4 | 1.7 (3) | 2.5 (1) |
| Alberta South of 58°N | 23 | 19 | 57 | 2.5 (23) | 3.0 (19) |
| Southern Interior, British Columbia | 1 | ND | ND | ND | ND |
| Lower Mainland, British Columbia | 5 ^a | ND | ND | ND | ND |
| Gulf Islands and SE Vancouver Island, British Columbia | 9 ^b | ND | ND | ND | ND |
| Alberta North of 58°N | 29 | 8 | 21 | 0.7 (29) | 2.6 (8) |
| Porcupine River, Yukon | 35 | 21 | 44 | 1.3 (35) | 2.1 (21) |
| Peel River, Yukon | 22 | 12 | 14 | 0.6 (22) | 1.2 (12) |
| Yukon River, Yukon | 46 | 22 | 68 | 1.5 (46) | 3.1 (22) |
| Southern Lakes, Yukon | ND | ND | ND | ND | ND |
| Mackenzie Valley, Northwest Territories | 80 | 36 | 80 | 1.0 (80) | 2.2 (36) |
| Totals/Means | 348 | 184 | 444 | 1.5 (348) | 2.5 (184) |

^a Although productivity was not specifically surveyed, a minimum of seven young were detected from four sites.

^b Of three nests checked for productivity, a minimum of six chicks was observed.

2.4 in 1995 to 2.5 in 2000 with particularly good reproduction in the prairie and Yukon River populations. Mean young/territorial pair was slightly lower in 2000 (1.5 down from 1.6 in 1995). However, there was a range of highs and lows in 2000, particularly in Alberta where the southern population averaged a high of 2.5 young/territorial pair compared to 0.7 young/territorial pair in the north. Reproductive output calculated for *anatum* for the seven national surveys conducted since 1970 give an unweighted mean of 2.2 young fledged/successful pair and 1.5 young fledged/territorial pair.

The goal of the 1988 *Anatum* Peregrine Falcon Recovery Plan (Erickson et al. 1988) was “to enhance the wild *anatum* Peregrine Falcon in Canada to a level at which it was no longer considered endangered or threatened by COSEWIC.” The main objectives were “to establish by 1992 a minimum of 10 territorial *anatum* pairs in each of zones 1 to 6 . . .” and “to establish by 1997 in each of five of those six zones (zones 1–6) a minimum of 10 territorial *anatum* pairs naturally fledging 15 or more young annually, measured as a five-year average

commencing in 1993.” These goals for territory occupancy and productivity were set as interim measures only and were achieved by 1995 (Banasch and Holroyd in press). As a result, COSEWIC downlisted *anatum*s in 1999 (Johnstone 1999). Although extinction was no longer believed to be a threat, the subspecies was retained in the threatened category, due to the uncertain status of populations that were slow to expand in the south.

The 2000 survey further verified that most *anatum* populations are either stable or increasing across Canada. However, whether or not populations in the south are completely self-sustaining remains to be seen. In southern Alberta and Ontario, approximately 50% and 33% of all identified adults are still red-banded (captive-raised and released, respectively). These numbers will decline in the near future (fostering and mass hacking for the most part no longer supplement production) as mortality claims this cohort. If the remaining population is indeed self-sustaining, natural output will replace the captive-raised peregrines with those produced in the wild without any significant decline in overall population size. The national mean

Table 5. Productivity of *tundrius* and *pealei* Peregrine Falcons in Canada during 2000. ND = no data.

| AREA | TERRITORIAL PAIRS | SUCCESSFUL PAIRS | TOTAL YOUNG | MEAN | |
|-----------------------------------------------------------|----------------------|---------------------|----------------|------------------------------------------------|----------------------------------------------------|
| | | | | YOUNG/ TERRITORIAL PAIR (SAMPLE SIZE) | MEAN YOUNG/ SUCCESSFUL PAIR (SAMPLE SIZE) |
| <i>Tundrius</i> | | | | | |
| Ungava Bay, Quebec | ND | ND | ND | ND | ND |
| North Slope, Yukon | 7 | 7 | 15 | 2.1 (7) | 2.1 (7) |
| Rankin Inlet, Nunavut | 22 | 16 | 37 | 1.7 (22) | 2.3 (16) |
| Tuktut Nogait National Park, Northwest Territories | 18 | 10 ^a | 18 | 1 (18) | 2.6 (10) ^b |
| Total/Mean | 47 | 33 | 70 | 1.6 (47) | 2.3 (33) |
| <i>Pealei</i> | | | | | |
| Langara Island, British Columbia | 7 | 5 | 9 | 1.3 (7) | 1.8 (5) |
| Queen Charlotte Island, British Columbia | 44 | ND | ND | ND | ND |
| Northern Vancouver and Scott Islands, British Columbia | 12 ^c | ND | ND | ND | ND |
| Triangle Island, British Columbia | 6 | ND | ND | ND | ND |
| Total/Mean | 69 | 5 | 9 | 1.3 | 1.8 |

^a Not included were six additional pairs which displayed extreme nest defense but were not confirmed as productive.

^b Calculated on seven pairs that produced a confirmed 18 young. The remaining three successful pairs had 1–2 or more young but numbers were not confirmed.

productivity has remained at about 1.5 young/territorial pair for the last decade.

Throughout the recovery process, there has been some concern expressed over the number of *anatum* nesting in urban settings or on man-made structures versus natural cliff sites. In 2000, of 162 known territories occupied by territorial *anatum* south of 58°N, 45 (28%) nested on buildings, bridges or industrial towers, while the rest (117 or 72%) nested on natural cliff sites. The proportion of urban sites was considerably lower than in 1990 (Holroyd and Banasch 1996).

***Tundrius* Populations.** The number of occupied territories and the number of territorial pairs is similar in 2000 to 1995 and 1990 numbers indicating stable populations of *tundrius* at Rankin Inlet and Tuktut Nogait National Park. While a larger area was surveyed on the Yukon's North Slope, this population is believed to be increasing slowly, although it remains relatively small. *Tundrius* reproductive outputs were 2.2 young/successful pair and 1.6 young/territorial pair, similar to 1995 values of 2.2 and 1.3, respectively.

***Pealei* Populations.** On the West Coast, *pealei* populations of the Queen Charlotte Islands, in-

cluding Langara Island, have probably been stable since surveys began. North Vancouver Island and the surrounding area were surveyed with greater effort in 2000, however, given the large increase in numbers, is probably experiencing some population growth. Reproduction data were limited for *pealei*. However, results from Langara Island in 2000 indicated a below average year with 1.8 young/successful pair and 1.3 young/territorial pair compared to 2.0 and 1.7 in the 1995 survey.

Thus, the known peregrine population in Canada, including all three subspecies, appears to be healthy and growing. Although this species is probably approaching full recovery in the north, it can be locally affected by factors such as annual weather events, forest fires or other natural conditions that affect nesting sites and nesting conditions. In southern Canada, populations continue to recover from the low numbers of the 1970s, expanding into available urban and rural habitat. However, mass reintroductions prior to 1997 are likely to remain an influence for the next 5 yr, until the last of this supplemental cohort is replaced. Although their impact is not well understood, factors such as erratic weather events, prey availability, competi-

Table 6. Productivity of Peregrine Falcons found in selected regions of Canada surveyed every 5 yr from 1970 to 2000. Productivity data indicate mean young fledged per successful pair and in parentheses, mean young fledged per territorial pair. ND = no data.

| AREA | 1970 | 1975 | 1980 | 1985-86 | 1990 | 1995 | 2000 |
|----------------------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| <i>anatum</i> | | | | | | | |
| Labrador, Newfoundland | 2.0 (2.0) | 0 | ND | 3.0 (1.5) | 3.3 (2.6) | 2.2 (1.0) | 2.4 (1.6) |
| Bay of Fundy (Nova Scotia, New Brunswick) | 0 | 0 | 0 | 0 | 2.0 (1.2) | 2.4 (2.0) | 2.0 (1.8) |
| Southern Quebec | 0 | ND | 2.0 (2.0) | 0 | 1.9 (1.4) | 2.6 (2.0) | 2.3 (1.6) |
| Southern Ontario | 0 | 0 | 0 | 0 | 2.0 (1.3) | 1.5 (1.1) | 2.6 (1.6) |
| Southern Manitoba | ND | ND | 0 | 0 | 2.0 (1.0) | 3.0 (1.5) | 4.0 (2.0) |
| Southern Saskatchewan | 0 | ND | 0 | 0 | 1.0 (0.5) | 1.5 (1.5) | 2.5 (1.7) |
| Southern Alberta | 3.0 (1.5) | 0 | 0 | 2.0 (2.0) | 1.5 (1.0) | 3.0 (0.8) | 3.0 (2.5) |
| Southern Interior British Columbia | | | | | | ND | ND |
| Lower Mainland, British Columbia | | | | | | ND | ND |
| Gulf and SE Vancouver Islands, British Columbia | | | | | | | ND |
| Northern Alberta | 0 | 0 | 3.2 (2.1) | 0 | 2.6 (1.4) | 2.8 (2.2) | 2.6 (0.7) |
| Porcupine River, Yukon | ND | ND | 1.7 (1.2) | 2.6 (2.0) | 2.8 (1.7) | 2.3 (1.3) | 2.1 (1.3) |
| Peel River, Yukon | ND | ND | 0 | 2.3 (1.9) | 3.2 (2.4) | 2.1 (0.9) | 1.2 (0.6) |
| Yukon River, Yukon | 2.0 (2.0) | 1.0 (0.4) | 2.2 (1.3) | 2.8 (2.2) | 2.4 (1.7) | 2.7 (1.6) | 3.1 (1.5) |
| Southern Lakes, Yukon | | | | | | 3.0 (3.0) | ND |
| Mackenzie Valley, Northwest Territories | 2.3 (1.4) | 1.3 (0.9) | 2.0 (1.5) | 2.1 (1.7) | 2.6 (2.1) | 2.6 (1.8) | 2.2 (1.0) |
| Means | 2.3 (1.7) | 1.2 (0.7) | 2.2 (1.6) | 2.5 (1.9) | 2.3 (1.5) | 2.4 (1.6) | 2.5 (1.5) |
| <i>tundrius</i> | | | | | | | |
| Ungava Bay, Quebec | 1.7 (1.3) | 1.8 (1.8) | 2.7 (2.7) | 3.2 (2.7) | 3.1 (2.9) | ND | ND |
| North Slope, Yukon | ND | ND | 0 | 0 | 0 | 2.3 (1.8) | 2.1 (2.1) |
| Rankin Inlet, Nunavut | ND | ND | 3.3 (2.9) | 1.8 (0.6) | 2.5 (0.8) | 2.1 (0.7) | 2.3 (1.7) |
| Tuktut Nogait National Park, Northwest Territories | | | | | | | 2.6 (1.0) |
| Means | 1.7 (1.3) | 1.8 (1.8) | 3.0 (2.8) | 2.5 (1.7) | 2.8 (1.9) | 2.2 (1.3) | 2.3 (1.6) |
| <i>pealei</i> | | | | | | | |
| Langara Island, British Columbia | 2.2 (2.2) | 2.4 (2.0) | 2.2 (2.2) | 2.0 (1.6) | 2.8 (2.0) | 2.0 (1.7) | 1.8 (1.3) |
| Queen Charlotte Islands, British Columbia | 2.5 (ND) | 3.2 (ND) | 2.5 (2.1) | ND | ND | ND | ND |
| Northern Vancouver Island, British Columbia | ND | ND | ND | ND | ND | ND | ND |
| Triangle Island, British Columbia | | | | | | | ND |
| Means | 2.4 (2.2) | 2.8 (2.0) | 2.4 (2.2) | 2.0 (1.6) | 2.8 (2.0) | 2.0 (1.7) | 1.8 (1.3) |

tion from other raptors, and human disturbance may also play a role in limiting occupancy and reproduction in some areas. An effort to understand the impact of such factors will ensure this species' existence is maintained in the future.

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